

**IV B.Tech. II Semester Supplementary Examinations, July -2005**

**ENVIRONMENT AND POLLUTION CONTROL**

**( Common to Mechanical Engineering and Production Engineering)**

**Time: 3 hours**

**Max Marks: 80**

**Answer any FIVE Questions  
All Questions carry equal marks**

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1. (a) Define and differentiate primary and secondary air pollutants. State any four examples and their sources for each category.  
(b) Write short notes on significance of air pollution in comparison with soil / water pollution.
2. Describe
  - (a) Heat islands
  - (b) Ozone holes
  - (c) Green house effect
3. (a) Explain the thermodynamics involved in the combustion of oil.  
(b) How the thermodynamics can be applied for the control of  $NO_2$  in combustion process.
4. (a) Explain Atmospheric stability in detail.  
(b) Write down about the effect of valleys on pollutant concentration.
5. Discuss the various types of atmospheric stabilities with reference to adiabatic lapse rate. Also discuss which type of stability is more favourable for dilution of pollutants.
6. (a) Define adsorption and differentiate between physical and chemical adsorption.  
(b) Name and describe three types of adsorbers.
7. (a) Explain the working principle of a filter bag with a neat sketch. Also explain the cleaning process of the filter bags.  
(b) Compare cyclone separators and filter bags.  
(c) Under what industrial conditions, the use of a fabric filter will be appropriate.
8. (a) Explain the working principle of wet scrubbers for particulate and pollutant gas removal.  
(b) Discuss the advantages and disadvantages of wet scrubbers.  
(c) Explain the working principle of electrostatic precipitator.

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1. (a) Discuss any one of major air pollution disaster.  
(b) What lesson you learn from air pollution disaster.
2. (a) Explain the effects of air pollution on human being.  
(b) Write short notes on effect of radioactive pollution on human health.
3. For the reaction  $\frac{1}{2}\text{N}_2 + \frac{1}{2}\text{O}_2 \rightarrow \text{NO}$ , the equilibrium compositions of NO and  $\text{O}_2$  at 4000K and 1Atm. Pressure are 100,000 PPM and 150,000PPm respectively
  - (a) To what N:O ratio this corresponds to
  - (b) What is the value of the equilibrium constant K?
  - (c) If the N:O ratio is now changed to 5:1 and the euilibrium of  $\text{O}_2$  obtained is the same as before what will be the concentration of NO in PPM.
4. (a) What are the two exchange mechanisms working between earth and the atmosphere, through which pollutants are continually removed  
(b) Explain the terms
  - i. Subsidence inversion
  - ii. Radiational inversion
5. Give briefly the essential features of the Gaussion Plume Model and discuss its limitations.
6. Explain the following equipment with neat sketches
  - (a) Multiple fixed - bed adsorber
  - (b) Single - bed adsorber
  - (c) Fluidized - bed adsorber
7. (a) Explain working of settling chamber for particulate removal.  
(b) Discuss the natural removal mechanism that work in the atmosphere.  
(c) A settling chamber of size is 12m 2m , 2m is processing 240  $\text{m}^3/\text{hr}$  of air at temp of  $75^\circ \text{C}$ . Determine the maximum size of particle with specific gravity of 1.8 that is removed with a theoretical efficiency of 100 %.
8. Write short notes on the following
  - (a) Air quality monitoring

- (b) Wet scrubbers
- (c) Zoning

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1. (a) Explain the role of Hydrocarbons in the oxidation of Nitrogen oxides?  
(b) Explain how NO contributes to acid rain formation? Give necessary equations?
2. Discuss the effects on human being due to the following air pollutants
  - (a) carbon monoxide
  - (b) nitrogen oxides
  - (c) insecticides
  - (d) ozone
3. Write short notes on
  - (a) Air fuel ratio
  - (b) Exhaust emissions
  - (c) Compression ratio
  - (d) Evaporative emissions
4. How the following parameter influences the Air quality
  - (a) Heat
  - (b) Pressure
  - (c) Wind
  - (d) Moisture
5. Sketch the following Plume Phenomena and discuss each sketch in relation to Dry adiabatic lapse rate.
  - (a) Looping
  - (b) funning
  - (c) trapping
  - (d) neutral
  - (e) lofting
  - (f) coning and
  - (g) fumigation

6. (a) Define adsorption and differentiate between physical and chemical adsorption.  
(b) Name and describe three types of adsorbers.
7. (a) Explain the working principle of a filter bag with a neat sketch. Also explain the cleaning process of the filter bags.  
(b) Compare cyclone separators and filter bags.  
(c) Under what industrial conditions, the use of a fabric filter will be appropriate.
8. (a) Explain the criteria for selection of particulate control equipments.  
(b) Describe with a neat sketch the working of electrostatic precipitator.

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1. (a) Mention the common air pollutants, their sources and the pathological effects on man?  
(b) List the major air pollutants and give the tolerance limits in ppm as well as  $\mu g/m^3$ .
2. (a) List the inorganic products formed from photochemical smog?  
(b) Explain the effect of particulate pollutants on plants?
3. (a) How the thermodynamics can be applied for the control of HC, in combustion Process  
(b) Explain the thermodynamics of the combustion of natural gas.
4. Explain the plume behavior with figures under various conditions of atmospheric stability.
5. Sketch the following Plume Phenomena and discuss each sketch in relation to Dry adiabatic lapse rate.
  - (a) Looping
  - (b) funning
  - (c) trapping
  - (d) neutral
  - (e) lofting
  - (f) coning and
  - (g) fumigation
6. Name and describe the suitable solvents used in industry for the removal of various gaseous Pollutants.
7. (a) Explain working of settling chamber for particulate removal.  
(b) Discuss the natural removal mechanism that work in the atmosphere.  
(c) A settling chamber of size is 12m x 2m x 2m is processing 240  $m^3/hr$  of air at temp of 75° c. Determine the maximum size of particle with specific gravity of 1.8 that is removed with a theoretical efficiency of 100 %.
8. (a) Explain how SPM and  $SO_2$  are monitored from industrial stacks.  
(b) Discuss on air quality management with the help of a flow diagram

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